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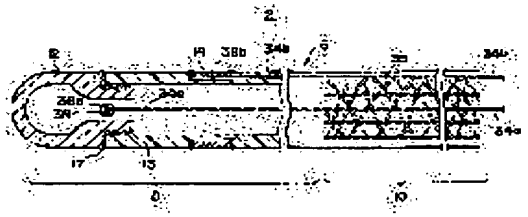
(54) ELECTRODE CATHETER

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an electrode catheter having a fine outer diameter, reducing the load of a patient, and easy to assemble.

SOLUTION: This electrode catheter 2 is fitted with electrodes 12, 14 at the distal end of the catheter 2 inserted into a body cavity, and electrode lead wires 34a, 34b connected to the electrodes 12, 14 are buried in the tube walls of tubes 8, 10 constituting a catheter main body 6. The electrode lead wires 34a, 34b are formed with part of the warps constituting a braid body for a reinforcing tube 10.



CLAIMS

[Claim(s)]
[Claim 1]An electrode catheter, wherein a lead for electrodes which is the electrode catheter with which it was equipped with two or more electrodes near a distal end of a catheter inserted into the abdominal cavity and the distal end, and is connected to said each electrode is embedded at a tube wall of a tube which constitutes a catheter body.
[Claim 2]Consist of a lead for an electrode and electrodes, a catheter body, and a grasping part, and a catheter body has a lumen which opens from a distal end to a proximal edge for free passage, A grasping part is provided in a proximal end part of this catheter body, and two or more electrodes are provided in a distal end of a catheter body, and a catheter body outer wall of a distal end, An electrode provided in a distal end makes bullet shape, and an electrode provided in a catheter body outer wall is making annular shape, An electrode catheter, wherein a lead for electrodes was embedded in a tube wall of a tube which constitutes a catheter body, it has inserted it in from a tube distal end to a proximal edge, one end is electrically connected with an electrode and the other end is developing on the outside of a grasping part.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to an electrode catheter.
[0002]
[Description of the Prior Art]An electrode catheter is used in order to measure a living body's potential (for example, electrocardio [tens of mV]), or in order to send the high frequency electrical and electric equipment through the living body affected part and to cauterize the affected part (ablation).
[0003]
[Problem(s) to be Solved by the Invention]Since a living body lumen (it is also hereafter called the abdominal cavity) is very thin, it is necessary to also make the outer diameter of an electrode catheter thin according to the inside diameter of the abdominal cavity. On the other hand, since an electrode catheter is stuffed into the affected part through the abdominal cavity from the outside of the body, it is required that torque transmission characteristics should be high.
[0004]Since the lead for electrodes has inserted the inside of a tube lumen in it in order to make the electrical and electric equipment lead in the electrode of an electrode catheter to the exterior from the outside, there is a limit in making thin the outer diameter of the electrode catheter which comprises a tube. It is for securing sufficient tube lumen to insert in two or more leads for electrodes.
[0005]Since two or more leads for electrodes needed to be inserted by the insulating state into the tube lumen, the assembly of the electrode catheter was complicated. This invention is made in view of such the actual condition, makes the outer diameter of an electrode catheter thin, eases a patient's burden, and aims to let an assembly provide an easy electrode catheter.
[0006]
[Means for Solving the Problem]To achieve the above objects, an electrode catheter concerning this invention, A lead for electrodes which is the electrode catheter with which it was equipped with two or more electrodes near a distal end of a catheter inserted into the abdominal cavity and the distal end, and is connected to said each electrode is embedded at a tube wall of a tube which constitutes a catheter body.
[0007]An electrode catheter concerning this invention more specifically, Consist of a lead for an electrode and electrodes, a catheter body, and a grasping part, and a catheter body has a lumen which opens from a distal end to a proximal edge for free passage, A grasping part is provided in a proximal end part of this catheter body, and two or more electrodes are provided in a distal end of a catheter body, and a catheter body outer wall of a distal end, An electrode provided in a distal end makes bullet shape, and an electrode provided in a catheter body outer wall is making annular shape, A lead for electrodes was embedded in a tube wall of a tube which constitutes a catheter body, and is inserted in from a tube distal end to a proximal edge, one end is electrically connected with an electrode, and the other end is developing on the outside of a grasping part.
[0008]In this invention, although a lead for electrodes in particular is not limited but should just be a conductive thing, it is preferred that they are covered wire, such as an enamel covered conductor. Although a lead for electrodes single about each electrode is usually connected, in order to lower resistance, two or more leads for electrodes may be connected about each electrode.
[0009]As for a lead for electrodes, in this invention, it is desirable to comprise some of conductive fibers for reinforcement currently embedded at a tube wall of an armored tube which constitutes at least some catheter bodies, or thread still more preferably. That is, when some of conductive fibers for reinforcement or thread develops even from a distal end to a proximal edge within a tube wall of a tube which constitutes a catheter body, it is preferred that a lead for electrodes is constituted. As a conductive fiber for reinforcement, or thread, especially if it has conductivity, it will not be limited, but it is preferred that it is a metal fiber, a wire, or a metallic thread insulated with polymer resin. However, even if it uses a naked metal fiber or thread as a conductive fiber for reinforcement, or thread, since it is insulated with resin of a tube wall, a knit lump does not cause an electric short circuit.
[0010]In this invention, temperature sensors, such as a thermo couple which measures temperature of an

electrode, can be formed, and it can also constitute so that a lead for the temperature sensor may also be embedded at a tube wall. In this invention, although construction material in particular of an electrode is not limited, it is preferred that it is the construction material which is not corroded within the abdominal cavity, and these alloys, such as platinum, iridium, a rhenium, and gold, and stainless steel are used preferably.
[0011]Although shape in particular of an electrode is not limited, either, as for the maximum distal end electrode attached to a distal end of a catheter, it is preferred that it is bullet shape in the air, and shape, such as dome shape, mushroom shape, and cylindrical shape, can be used for it. An annular thing of an electrode for outer walls with which a periphery of a catheter body is equipped near the maximum distal end electrode is preferred. thickness of an electrode -- 0.05-0.2 mm and its shaft-orientations length -- 1-10 mm and an outer diameter of those -- an outer diameter of a catheter body -- it is the same (a level difference does not arise -- as) -- carrying out is preferred and it is usually 1-3 mm. It is preferred to fill up a joint (level difference) portion of an electrode for outer walls and a catheter body with resin, and to lose a level difference.
[0012]In this invention, methods, such as soldering or welding, are employable as a method for electrically connecting an end of a lead for electrodes inside an electrode. A connection destination end of a lead is contacted to an electrode, and, specifically, connection resilience improves soldering or by carrying out flame welding. As solder, an alloy of tin-silver is preferred. Compared with an alloy containing lead, cadmium, etc., it is because biocompatibility is high.
[0013]In this invention, it is preferred to cover the circumference of a terminal area of an electrode and a lead. Especially as this resin, although not limited, any may be sufficient as urethane resin, an epoxy resin, an acrylic resin, etc. A desirable thing usable also as adhesives as resin is good. As adhesives, an epoxy adhesive, an acrylic adhesive, urethane application, cyanoacrylate adhesive, etc. can be illustrated.
[0014]In this invention, especially as a tube which constitutes a catheter body, it may not be limited but a tube reinforced with rigid grant objects, such as a wire braid or a coil tube, may be used like the usual catheter. In this invention, a part of conductive wire line which carries out the distraction can be used for shaft orientations of the wire braids embedded at reinforcement as a lead for electrodes.
[0015]Especially as a grasping part provided in a proximal edge of an electrode catheter concerning this invention, it is not limited but a grasping part which an outer diameter can be made easy to have by hand greatly rather than a catheter body may be used like the usual catheter. A use in particular of an electrode catheter concerning this invention is not limited, but can be used for a therapy which uses and heats an electrode in addition to cautery of an organization which should cautery-treat [of Kent's bundle of the heart] and should remove, or cautery, or a use which measures a living body's potential using an electrode.
[0016]
[Function]In the electrode catheter concerning this invention, the lead for electrodes connected to each electrode is embedded at the tube wall of the tube which constitutes a catheter body. For this reason, in order to make two or more leads for electrodes insert in, it becomes unnecessary to secure the inside diameter of the lumen of a tube greatly, the outer diameter of an electrode catheter can be made small, and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of a tube becomes unnecessary, and the assembly of an electrode catheter becomes easy.
[0017]In this invention, an insulation of each lead for electrodes is secured with the insulating resin which constitutes a tube. In this invention, in constituting the lead for electrodes from some of conductive fibers for reinforcement currently embedded at the tube wall of the armored tube which constitutes at least some catheter bodies, or thread (what is prolonged in shaft orientations), It becomes unnecessary to newly prepare the lead for electrodes, and the assembly of an electrode catheter becomes still easier. Since it is insulated with the polymer resin which constitutes an armored tube, this conductive fiber for reinforcement or thread does not have fear of an electric short circuit, either, when it uses as a lead for electrodes. Therefore, it becomes unnecessary [the special processing for preventing a short circuit].
[0018]
[Embodiment of the Invention]Hereafter, the electrode catheter concerning this invention is explained in detail based on the embodiment shown in a drawing. The electrode catheter concerning this embodiment shown in drawing 1 - 8 is an electrode catheter used for the cautery therapy of the Kent's bundle of the heart, etc., for example.
[0019]As shown in drawing 6, the electrode catheter 2 concerning this embodiment has the grasping part 4 provided in the proximal edge of the catheter, and the tube shape catheter body 6 joined to this grasping part 4. The catheter body 6 has the 1st tube 8 formed in the distal end side, and the 2nd tube 10 linked to the proximal edge of this 1st tube 8.
[0020]These tubes 8 and 10 are 1 mm - 3 mm in outer diameters preferably 0.3 mm - 5 mm.
An inside diameter is 0.8-2.8 mm preferably 0.1 mm - 4.8 mm.
As the raw material, flexible resin of anti-thrombus nature is preferred, and it is preferred to comprise polyurethane, polyamide, polyvinyl chloride, etc.

[0021]As for the 2nd tube 10 by the side of a proximal edge, as compared with the 1st tube 8 by the side of a distal end, it is preferred that they are high hardness or high rigidity. for example, the hardness of the 1st tube 8 -- shore hardness -- 10D-55D, and the case where it is preferably referred to as 25D-45D -- the hardness of the 2nd tube 10 -- 50D-90D -- they are 55D-75D preferably. Rigidity of the 2nd tube 10 by the side of a proximal edge may be made high, and a coiled member may be arranged inside the 2nd tube 10 so that torsion, bending, etc. unnecessary for the 2nd tube 10 by the side of a proximal edge at the time of crookedness of the 1st tube 8 may not arise.
[0022]As shown in drawing 1, the armored tube reinforced with the braid object constitutes the 2nd tube 10 from this embodiment. A braid object comprises the warp prolonged in shaft orientations, and the weft 35 prolonged in a hoop direction, and is built in the tube wall of the 2nd tube. According to this embodiment, in order to constitute the warp prolonged in the shaft orientations of the braid objects from a conductive fiber or thread and to use several [of warp] as the lead 34a for electrodes, and 34b--, it arranges so that it may extend from the distal end of a catheter body to the exterior of a proximal edge.
[0023]As the conductive fiber or thread which can be used in this embodiment, copper, stainless steel, silver, platinum, tungsten, a silver alloy, etc. can be illustrated, and the fiber diameter or yarn diameter is determined that the low resistance below a request is obtained. Although a conductive fiber or thread may be sufficient as the weft 35 of the braid object built in the 2nd tube 10 that comprises a tube for reinforcement like warp, it may be insulating textiles or thread. When it constitutes the weft 35 from a conductive fiber or thread, it is preferred to be knit so that between conductive warp may not connect too hastily. It may constitute so that pre-insulation of the periphery of the conductive fiber which constitutes warp or the weft, or thread may be carried out.
[0024]The 1st tube 8 by the side of a distal end consists of construction material which was excellent in flexibility as compared with the 2nd tube 10 in order to make the 1st tube 8 crooked according to a request so that it may mention later. Although the shaft-orientations length in particular of the 1st tube 8 that is a crooked part is not limited, its about 30-100 mm is preferred.
[0025]As shown in drawing 1, it has equipped with the maximum distal end electrode 12 at the tip of the 1st tube 8 by the side of a distal end. As shown in drawing 1 and 6, the shaft-orientations prescribed interval is equipped with the annular electrodes 14, 16, and 18 for outer walls at the proximal edge side of the maximum distal end electrode 12. As for these electrodes 12, 14, 16, and 18, it is preferred that it is the construction material which is not corroded within the abdominal cavity, and these alloys, such as platinum, iridium, a rhenium, and gold, and stainless steel are used preferably.
[0026]The maximum distal end electrode 12 is bullet shape as shown in drawing 3.
A tip has the shape of a hemispherical surface, the inside has become in midair, and the heights 13 by which a whorl projected part or a bellows projection was formed in the back end side periphery are formed.
The heights 13 are inserted in a lumen from the distal end of the 1st tube 8 shown in drawing 1, and the maximum distal end electrode 12 is joined to the distal end of the 1st tube 8 by the adhesives 17 or thermo compression bonding. As the adhesives 17, adhesives excellent in heat resistance are used preferably, for example, an epoxy adhesive, cyanoacrylate adhesives, urethane application, etc. are used. The outer diameter of this maximum distal end electrode 12 is the same in the outer diameter of the 1st tube 8, and abbreviation. This maximum distal end electrode 12 is used as an electrode for cautery.
[0027]It was equipped with the electrodes 14, 16, and 18 for outer walls in order to mainly measure voltage in its mind, and they have constituted annular shape. As shown in drawing 2, two or more circular sulci 17 are formed in shaft orientations at the periphery of the 1st tube 8, and each of those slots 17 are equipped with each electrodes 14, 16, and 18 for outer walls. The circular sulcus 17 is formed, for example of cutting or thermoforming.
[0028]In order to do easy the work which equips the circular sulcus of the 1st tube 8 with the electrodes 14, 16, and 18 for outer walls, a part of hoop direction of the electrode for outer walls may cut and lack. The annular electrodes 14, 16, and 18 for these outer walls may be divided into 2 or more ****s in the hoop direction. The shaft-orientations length of the electrodes 14, 16, and 18 for these outer walls is 1-10 mm.
The diameter direction thickness is 0.05-0.2 mm, and it is preferred to provide the one to 20 number in shaft orientations in the pitch of 0.5-30 mm.
the outer diameter of the electrodes 14, 16, and 18 for these outer walls -- the outer diameter of the catheter body 6 -- it is the same (a level difference does not arise -- as) -- carrying out is preferred. It is preferred to fill up the joint (level difference) portion of the electrodes 14, 16, and 18 for outer walls and the catheter body 6 with the resin 30 for joints, and to lose a level difference. The thing same as the resin 30 for joints as the resin 38 for covering mentioned later is used, and a thing usable as adhesives is preferred.
[0029]As shown in drawing 1 and 3, the end of the lead 34a for electrodes is electrically connected inside the heights 13 of the maximum distal end electrode 12, and the terminal area 36a consists of these embodiments. The circumference of this terminal area 36a is covered with the resin 38 for covering. As shown in drawing 2 and 4, the end of another lead 34b for electrodes is electrically connected inside the electrode 14 for outer walls,

and the terminal area 36b is constituted. The circumference of this terminal area 36b is covered with the resin 38 for covering. The same may be said of the other electrodes 16 and 18 for outer walls.
[0030]In order to connect an each leads [for electrodes / 34a, 34b, 34c, and 34d] end inside these electrodes 12, 14, 16, and 18, methods, such as soldering or welding, are employable. specifically contacting the connection destination end of the lead 34a to the electrode 12 -- soldering -- or flame welding is carried out. It is the same also about other electrodes. Thereby, connection resilience improves. As solder, the alloy of tin-silver is preferred. Compared with the alloy containing lead, cadmium, etc., it is because biocompatibility is high.
[0031]As the resin 38 for covering, any may be sufficient as urethane resin, an epoxy resin, an acrylic resin, etc. A desirable thing usable also as adhesives as resin is good. As adhesives, an epoxy adhesive, an acrylic adhesive, urethane application, cyanoacrylate adhesive, etc. can be illustrated. The filling body products of this resin 38 are the terminal area 36a and the volume which covers 36b-- thoroughly.
It is 1-18cm^3 preferably.

[0032]The lead 34a for electrodes and 34b-- constitute at least some warp of the braid object for reinforcement from the 2nd tube 10 that is an armored tube, as shown in drawing 1.
It is embedded at the tube wall of the tube 10, and has formed.
If another word is carried out, some braid objects currently embedded at the tube wall of the 2nd tube 10 that is an armored tube are extended from the distal end of the catheter body 6 to the proximal edge exterior, and they are used as the lead 34a for electrodes, and 34b--. It is the lead 34a for electrodes, and the connection structure of 34b-- which mentioned the distal end above, and has connected with each electrodes 12, 14, 16, and 18, and those proximal edges jump out of the proximal edge of the catheter body 6, and are connectable to the external terminal. As shown in drawing 6, when the proximal edge of the catheter body 6 is equipped with the grasping part 4, the thing of a proximal edge of the lead 34a for electrodes and 34b-- exposed to the exterior from the grasping part 4 is preferred. Leads 34a and 34b for electrodes -- A proximal edge may be connected to an external terminal inside the grasping part 4.
[0033]Next, an example of the manufacturing method of the catheter body 6 of the electrode catheter 2 concerning this embodiment is explained. As shown in drawing 5 (A), the inner tube 6a is prepared first. The inner tube 6a comprises synthetic resins, such as polyurethane, polyamide, and a fluoro-resin, for example, an outer diameter is 0.8-2.2 mm, and an inside diameter is 0.6-2.1 mm. The shaft-orientations length is equivalent to the shaft-orientations length of the catheter body 6.
[0034]Next, as shown in drawing 5 (B), the lead 34a for electrodes prolonged in shaft orientations and the conductive warp used as 34b-- are arranged on the periphery of the inner tube 6a, and in the portion used as an armored tube, it knits on it with the weft 35, and a lump braid object is formed in it. A distal end (the terminal area 36a, 36b--) is extended to the position of the lead 34a for electrodes which comprises conductive warp, and 34b-- to which each electrode is attached, those proximal edges extend so that it may jump out of the proximal edge of the inner tube 6a, and those proximal edges are equipped with the contact button 37a and 37b--.
[0035]Next, the portion equipped with the braid object in the inner tube 6a as shown in drawing 5 (C), A periphery with the portion equipped with the lead 34a for electrodes prolonged in shaft orientations and 34b-- is covered with the common outer tube 6b, and the 1st tube 8 and the 2nd tube 10 which constitute the catheter body 6 concerning this embodiment are obtained. The outer tube 6b comprises polyurethane, polyamide, a fluoro-resin, etc., for example, and is fabricated by a dipping method or extrusion molding.
[0036]next, it is shown in drawing 6 -- as -- the distal end of the catheter body 6 -- winding -- the mechanism for making it movable is explained. Although omitted in drawing 1, the inside of the 1st tube 8 formed in the distal end of the catheter body 6 is equipped with the elastic plate 40 shown in drawing 7 along with the longitudinal direction. This elastic plate 40 comprises a resin board etc. which have spring steel material and elasticity, for example, and it has adhered to the maximum distal end electrode 12 via the fixture 44 from which that distal end was insulated. The fixture 44 may be fabricated by the electrode 12 and one. The proximal edge of the elastic plate 40 is near [boundary part 11] the 1st tube 8 and the 2nd tube 10 which are shown in drawing 6, and is fixed to the 2nd tube 10. When the coil member is arranged in the 2nd tube 10, the proximal edge of the elastic plate 40 may be joined to the distal end of the coil member. Or the stopper member of ring shape may be arranged and the proximal edge of the elastic plate 40 may be made to join or contact this stopper member in about 11 terminal area.
[0037]As shown in drawing 7, the elastic piece 40 is built over the wire 42 for operation along with the longitudinal direction, and the distal end of the wire 42 for operation is joined to the fixture 44. It may join to the distal end of the elastic piece 40 directly, and the distal end of this wire 42 for operation may be joined to the electrode 12. This wire 42 has inserted in the inside of the covering tube 46. This wire 42 passes along the inside of the lumen of the catheter body 6 shown in drawing 6, and that proximal edge is fixed to the top object provided in the inside of the grasping part 4 enabling free axial movement. This top object moves to shaft

orientations by rotating the ring shape handle 20 which is shown in drawing 6 and which can be rotated. That is, a top object can move to shaft orientations, the wire 42 for operation can be pulled to the shaft-orientations proximal edge side, and a real line position can be made to carry out winding movement of the elastic plate 40 by rotating the handle 20 from the two-dot chain line position shown in drawing 7. If an opposite direction is made to rotate the handle 20, the elastic piece 40 will perform winding movement contrary to the above.

[0038]As a means for changing the rotation of the handle 20 to the shaft movement of a top object, screwing combination etc. are employable. Rotation of the handle 20 shown in drawing 6 can perform winding movement of the elastic piece 40 from the two-dot chain line position shown in drawing 6 to a real line position, and a screwing release means can also perform movement from a real line position to a dotted-line position. That is, the grasping part 4 may be equipped with the button for canceling screwing with the handle 20 and a top object, and returning a top object to the original position, etc.

[0039]The optional position between a graphic display top two-dot chain line position and a real line position can be made to carry out winding movement of the 1st tube 8 by the side of the distal end of the catheter body 6 which can control winding movement of the elastic piece 40 by moving the wire 42 to shaft orientations, and is shown in drawing 7 as a result, as shown in drawing 7. Thereby, the electrode 12 can be made to tend toward the position of an arbitrary direction in a patient's body.

[0040]Next, the example of a therapy using the electrode catheter concerning this embodiment is shown. As shown in drawing 8, the catheter body of the electrode catheter 2 is inserted so that through and its distal end may reach to the left ventricle 85 of the heart 81 to the femoral artery 93. In that case, operate the handle 20 shown in drawing 6 located in the outside-of-the-body side, it is made to tend toward the position of a request of the distal end of the catheter body 6, and the electrode 12 is brought close to Kent's bundle 92. And the high frequency current is energized with the high frequency generator 97 between the electrode 12 and the counter electrode plate 96 located in a patient's back. Although energizing conditions in particular are not limited, they are about 300-750 kHz and about output 5-50W, for example.

[0041]The coagulation necrosis of the field (a depth of 5 mm and 10 mm in width) containing the Kent's bundle which is the arrhythmic cause in this way can be cauterized and carried out. the inside of drawing 8 and the numerals 82 -- a right atrium and 83 -- ****** and 87 show sino atrial ****, 88 shows atrioventricular ****, and, as for the left atrium and 86, a right ventricle and 84 show a nerve 89, 90, and 91.

[0042]In the electrode catheter 2 concerning this embodiment, the leads 34a, 34b, 34c, and 34d for electrodes connected to each electrodes 12, 14, 16, and 18 are embedded at the tube wall of the tubes 8 and 10 which constitute the catheter body 6. For this reason, in order to make two or more leads for electrodes insert in, it becomes unnecessary to secure the inside diameter of the lumen of the tubes 8 and 10 greatly, the outer diameter of the electrode catheter 2 can be made small, and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of the tubes 8 and 10 becomes unnecessary, and the assembly of the electrode catheter 2 becomes easy. At this embodiment, since it is considered as the lead for electrodes using the part of the conductive fiber for reinforcement needed in the 2nd tube 10 that comprises an armored tube, or the thread, it becomes without newly preparing the lead for electrodes, and the assembly nature of an electrode catheter improves also at this point.

[0043]According to this embodiment, an insulation is secured with the insulating resin of each lead 34a for electrodes, and 34b-- which constitutes the 1st tube 8 and the 2nd tube 10. Therefore, it becomes unnecessary [the special processing for preventing a short circuit]. As shown in drawing 1 - 4, the lead 34a for electrodes and the terminal area 36 of 34b-- which an end electrically connects are formed inside the electrodes 12 and 14, and the resin 38 for covering has covered the circumference of this terminal area 36 in this embodiment. For this reason, it is lost that body fluid trespasses upon the terminal area of the dissimilar metal which are the terminal areas 36a and 36b of the lead 34 and the electrodes 12 and 14, and forming a cell in that portion is lost. As a result, when sending the high frequency current through an electrode and cauterizing the affected part using this electrode catheter, the connection section of an electrode and a lead is low resistance, and the affected part can be cauterized efficiently.

[0044]this invention is not limited to the embodiment mentioned above, within the limits of this invention, can be boiled variously and can be changed. For example, although the embodiment mentioned above is the example which formed in an electrode catheter and one a means to carry out winding movement of the distal end side of an electrode catheter, this invention is not limited to this embodiment. In this invention, the inside of an electrode catheter is used as the cave in shaft orientations, another catheter for operation can be inserted into this cave, and winding moving operation of the distal end of an electrode catheter can also be carried out by this catheter for operation.

[0045]Although a means to have a ring shape handle shown in drawing 6 was used in the above-mentioned embodiment as a control means for carrying out winding movement of the distal end side of an electrode catheter, this invention is not limited to these control means, but can use a lever shape control means or other means.

[0046]Although the cautery therapy was performed in the embodiment mentioned above using the electrode catheter concerning this invention, it may use for the use which detects biopotentials, such as electrocardio, using the electrode of an electrode catheter as the other use. In that case, the lead for electrodes turns into a signal wire for transmitting the biopotential produced in the electrode to the exterior. Also in this embodiment, without doing so the same operation as said embodiment, and forming a cell in that portion, since the terminal area of the lead for electrodes and an electrode is covered by resin, noise decreases and biopotential can be detected more correctly.

[0047]

[Effect of the Invention]As explained above, according to this invention, the outer diameter of an electrode catheter can be made small and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of a tube becomes unnecessary, and the assembly of an electrode catheter becomes easy. In this invention, an insulation of each lead for electrodes is secured with the insulating resin which constitutes a tube.

[0048]In this invention, in constituting the lead for electrodes from some of conductive fibers for reinforcement currently embedded at the tube wall of the armored tube which constitutes at least some catheter bodies, or thread (what is prolonged in shaft orientations), It becomes unnecessary to newly prepare the lead for electrodes, and the assembly of an electrode catheter becomes still easier. Since it is insulated with the polymer resin which constitutes an armored tube, this conductive fiber for reinforcement or thread does not have fear of an electric short circuit, either, when it uses as a lead for electrodes. Therefore, it becomes unnecessary [the special processing for preventing a short circuit].

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]This invention relates to an electrode catheter.

[Translation done.]

PRIOR ART

[Description of the Prior Art]An electrode catheter is used in order to measure a living body's potential (for example, electrocardio [tens of mV]), or in order to send the high frequency electrical and electric equipment through the living body affected part and to cauterize the affected part (ablation).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, according to this invention, the outer diameter of an electrode catheter can be made small and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of a tube becomes unnecessary, and the assembly of an electrode catheter becomes easy. In this invention, an insulation of each lead for electrodes is secured with the insulating resin which constitutes a tube.
[0048]In this invention, in constituting the lead for electrodes from some of conductive fibers for reinforcement currently embedded at the tube wall of the armored tube which constitutes at least some catheter bodies, or thread (what is prolonged in shaft orientations), It becomes unnecessary to newly prepare the lead for electrodes, and the assembly of an electrode catheter becomes still easier. Since it is insulated with the polymer resin which constitutes an armored tube, this conductive fiber for reinforcement or thread does not have fear of an electric short circuit, either, when it uses as a lead for electrodes. Therefore, it becomes unnecessary [the special processing for preventing a short circuit].

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Since a living body lumen (it is also hereafter called the abdominal cavity) is very thin, it is necessary to also make the outer diameter of an electrode catheter thin according to the inside diameter of the abdominal cavity. On the other hand, since an electrode catheter is stuffed into the affected part through the abdominal cavity from the outside of the body, it is required that torque transmission characteristics should be high.
[0004]Since the lead for electrodes has inserted the inside of a tube lumen in it in order to make the electrical and electric equipment lead in the electrode of an electrode catheter to the exterior from the outside, there is a limit in making thin the outer diameter of the electrode catheter which comprises a tube. It is for securing sufficient tube lumen to insert in two or more leads for electrodes.
[0005]Since two or more leads for electrodes needed to be inserted by the insulating state into the tube lumen, the assembly of the electrode catheter was complicated. This invention is made in view of such the actual condition, makes the outer diameter of an electrode catheter thin, eases a patient's burden, and aims to let an assembly provide an easy electrode catheter.

[Translation done.]

MEANS

[Means for Solving the Problem]To achieve the above objects, an electrode catheter concerning this invention, A lead for electrodes which is the electrode catheter with which it was equipped with two or more electrodes near a distal end of a catheter inserted into the abdominal cavity and the distal end, and is connected to said each electrode is embedded at a tube wall of a tube which constitutes a catheter body.
[0007]An electrode catheter concerning this invention more specifically, Consist of a lead for an electrode and electrodes, a catheter body, and a grasping part, and a catheter body has a lumen which opens from a distal end to a proximal edge for free passage, A grasping part is provided in a proximal end part of this catheter body, and two or more electrodes are provided in a distal end of a catheter body, and a catheter body outer wall of a distal end, An electrode provided in a distal end makes bullet shape, and an electrode provided in a catheter body outer wall is making annular shape, A lead for electrodes was embedded in a tube wall of a tube which constitutes a catheter body, and is inserted in from a tube distal end to a proximal edge, one end is electrically connected with an electrode, and the other end is developing on the outside of a grasping part.
[0008]In this invention, although a lead for electrodes in particular is not limited but should just be a conductive thing, it is preferred that they are covered wire, such as an enamel covered conductor. Although a lead for electrodes single about each electrode is usually connected, in order to lower resistance, two or more leads for electrodes may be connected about each electrode.
[0009]As for a lead for electrodes, in this invention, it is desirable to comprise some of conductive fibers for reinforcement currently embedded at a tube wall of an armored tube which constitutes at least some catheter bodies, or thread still more preferably. That is, when some of conductive fibers for reinforcement or thread develops even from a distal end to a proximal edge within a tube wall of a tube which constitutes a catheter body, it is preferred that a lead for electrodes is constituted. As a conductive fiber for reinforcement, or thread, especially if it has conductivity, it will not be limited, but it is preferred that it is a metal fiber, a wire, or a metallic thread insulated with polymer resin. However, even if it uses a naked metal fiber or thread as a conductive fiber for reinforcement, or thread, since it is insulated with resin of a tube wall, a knit lump does not cause an electric short circuit.
[0010]In this invention, temperature sensors, such as a thermo couple which measures temperature of an electrode, can be formed, and it can also constitute so that a lead for the temperature sensor may also be embedded at a tube wall. In this invention, although construction material in particular of an electrode is not limited, it is preferred that it is the construction material which is not corroded within the abdominal cavity, and these alloys, such as platinum, iridium, a rhenium, and gold, and stainless steel are used preferably.
[0011]Although shape in particular of an electrode is not limited, either, as for the maximum distal end electrode attached to a distal end of a catheter, it is preferred that it is bullet shape in the air, and shape, such as dome shape, mushroom shape, and cylindrical shape, can be used for it. An annular thing of an electrode for outer walls with which a periphery of a catheter body is equipped near the maximum distal end electrode is preferred. thickness of an electrode -- 0.05-0.2 mm and its shaft-orientations length -- 1-10 mm and an outer diameter of those -- an outer diameter of a catheter body -- it is the same (a level difference does not arise -- as) -- carrying out is preferred and it is usually 1-3 mm. It is preferred to fill up a joint (level difference) portion of an electrode for outer walls and a catheter body with resin, and to lose a level difference.
[0012]In this invention, methods, such as soldering or welding, are employable as a method for electrically connecting an end of a lead for electrodes inside an electrode. A connection destination end of a lead is contacted to an electrode, and, specifically, connection resilience improves soldering or by carrying out flame welding. As solder, an alloy of tin-silver is preferred. Compared with an alloy containing lead, cadmium, etc., it is because biocompatibility is high.
[0013]In this invention, it is preferred to cover the circumference of a terminal area of an electrode and a lead. Especially as this resin, although not limited, any may be sufficient as urethane resin, an epoxy resin, an acrylic resin, etc. A desirable thing usable also as adhesives as resin is good. As adhesives, an epoxy adhesive, an acrylic adhesive, urethane application, cyanoacrylate adhesive, etc. can be illustrated.
[0014]In this invention, especially as a tube which constitutes a catheter body, it may not be limited but a tube

reinforced with rigid grant objects, such as a wire braid or a coil tube, may be used like the usual catheter. In this invention, a part of conductive wire line which carries out the distraction can be used for shaft orientations of the wire braids embedded at reinforcement as a lead for electrodes.

[0015]Especially as a grasping part provided in a proximal edge of an electrode catheter concerning this invention, it is not limited but a grasping part which an outer diameter can be made easy to have by hand greatly rather than a catheter body may be used like the usual catheter. A use in particular of an electrode catheter concerning this invention is not limited, but can be used for a therapy which uses and heats an electrode in addition to cautery of an organization which should cautery-treat [of Kent's bundle of the heart] and should remove, or cautery, or a use which measures a living body's potential using an electrode.

[Translation done.]

OPERATION

[Function]In the electrode catheter concerning this invention, the lead for electrodes connected to each electrode is embedded at the tube wall of the tube which constitutes a catheter body. For this reason, in order to make two or more leads for electrodes insert in, it becomes unnecessary to secure the inside diameter of the lumen of a tube greatly, the outer diameter of an electrode catheter can be made small, and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of a tube becomes unnecessary, and the assembly of an electrode catheter becomes easy.
[0017]In this invention, an insulation of each lead for electrodes is secured with the insulating resin which constitutes a tube. In this invention, in constituting the lead for electrodes from some of conductive fibers for reinforcement currently embedded at the tube wall of the armored tube which constitutes at least some catheter bodies, or thread (what is prolonged in shaft orientations), It becomes unnecessary to newly prepare the lead for electrodes, and the assembly of an electrode catheter becomes still easier. Since it is insulated with the polymer resin which constitutes an armored tube, this conductive fiber for reinforcement or thread does not have fear of an electric short circuit, either, when it uses as a lead for electrodes. Therefore, it becomes unnecessary [the special processing for preventing a short circuit].
[0018]
[Embodiment of the Invention]Hereafter, the electrode catheter concerning this invention is explained in detail based on the embodiment shown in a drawing. The electrode catheter concerning this embodiment shown in drawing 1 - 8 is an electrode catheter used for the cautery therapy of the Kent's bundle of the heart, etc., for example.
[0019]As shown in drawing 6, the electrode catheter 2 concerning this embodiment has the grasping part 4 provided in the proximal edge of the catheter, and the tube shape catheter body 6 joined to this grasping part 4. The catheter body 6 has the 1st tube 8 formed in the distal end side, and the 2nd tube 10 linked to the proximal edge of this 1st tube 8.
[0020]These tubes 8 and 10 are 1 mm - 3 mm in outer diameters preferably 0.3 mm - 5 mm.
An inside diameter is 0.8-2.8 mm preferably 0.1 mm - 4.8 mm.
As the raw material, flexible resin of anti-thrombus nature is preferred, and it is preferred to comprise polyurethane, polyamide, polyvinyl chloride, etc.
[0021]As for the 2nd tube 10 by the side of a proximal edge, as compared with the 1st tube 8 by the side of a distal end, it is preferred that they are high hardness or high rigidity. for example, the hardness of the 1st tube 8 -- shore hardness -- 10D-55D, and the case where it is preferably referred to as 25D-45D -- the hardness of the 2nd tube 10 -- 50D-90D -- they are 55D-75D preferably. Rigidity of the 2nd tube 10 by the side of a proximal edge may be made high, and a coiled member may be arranged inside the 2nd tube 10 so that torsion, bending, etc. unnecessary for the 2nd tube 10 by the side of a proximal edge at the time of crookedness of the 1st tube 8 may not arise.
[0022]As shown in drawing 1, the armored tube reinforced with the braid object constitutes the 2nd tube 10 from this embodiment. A braid object comprises the warp prolonged in shaft orientations, and the weft 35 prolonged in a hoop direction, and is built in the tube wall of the 2nd tube. According to this embodiment, in order to constitute the warp prolonged in the shaft orientations of the braid objects from a conductive fiber or thread and to use several [of warp] as the lead 34a for electrodes, and 34b--, it arranges so that it may extend from the distal end of a catheter body to the exterior of a proximal edge.
[0023]As the conductive fiber or thread which can be used in this embodiment, copper, stainless steel, silver, platinum, tungsten, a silver alloy, etc. can be illustrated, and the fiber diameter or yarn diameter is determined that the low resistance below a request is obtained. Although a conductive fiber or thread may be sufficient as the weft 35 of the braid object built in the 2nd tube 10 that comprises a tube for reinforcement like warp, it may be insulating textiles or thread. When it constitutes the weft 35 from a conductive fiber or thread, it is preferred to be knit so that between conductive warp may not connect too hastily. It may constitute so that pre-insulation of the periphery of the conductive fiber which constitutes warp or the weft, or thread may be carried out.
[0024]The 1st tube 8 by the side of a distal end consists of construction material which was excellent in

flexibility as compared with the 2nd tube 10 in order to make the 1st tube 8 crooked according to a request so that it may mention later. Although the shaft-orientations length in particular of the 1st tube 8 that is a crooked part is not limited, its about 30-100 mm is preferred.

[0025]As shown in drawing 1, it has equipped with the maximum distal end electrode 12 at the tip of the 1st tube 8 by the side of a distal end. As shown in drawing 1 and 6, the shaft-orientations prescribed interval is equipped with the annular electrodes 14, 16, and 18 for outer walls at the proximal edge side of the maximum distal end electrode 12. As for these electrodes 12, 14, 16, and 18, it is preferred that it is the construction material which is not corroded within the abdominal cavity, and these alloys, such as platinum, iridium, a rhenium, and gold, and stainless steel are used preferably.

[0026]The maximum distal end electrode 12 is bullet shape as shown in drawing 3.

A tip has the shape of a hemispherical surface, the inside has become in midair, and the heights 13 by which a whorl projected part or a bellows projection was formed in the back end side periphery are formed.

The heights 13 are inserted in a lumen from the distal end of the 1st tube 8 shown in drawing 1, and the maximum distal end electrode 12 is joined to the distal end of the 1st tube 8 by the adhesives 17 or thermo compression bonding. As the adhesives 17, adhesives excellent in heat resistance are used preferably, for example, an epoxy adhesive, cyanoacrylate adhesives, urethane application, etc. are used. The outer diameter of this maximum distal end electrode 12 is the same in the outer diameter of the 1st tube 8, and abbreviation. This maximum distal end electrode 12 is used as an electrode for cautery.

[0027]It was equipped with the electrodes 14, 16, and 18 for outer walls in order to mainly measure voltage in its mind, and they have constituted annular shape. As shown in drawing 2, two or more circular sulci 17 are formed in shaft orientations at the periphery of the 1st tube 8, and each of those slots 17 are equipped with each electrodes 14, 16, and 18 for outer walls. The circular sulcus 17 is formed, for example of cutting or thermoforming.

[0028]In order to do easy the work which equips the circular sulcus of the 1st tube 8 with the electrodes 14, 16, and 18 for outer walls, a part of hoop direction of the electrode for outer walls may cut and lack. The annular electrodes 14, 16, and 18 for these outer walls may be divided into 2 or more ****s in the hoop direction. The shaft-orientations length of the electrodes 14, 16, and 18 for these outer walls is 1-10 mm.

The diameter direction thickness is 0.05-0.2 mm, and it is preferred to provide the one to 20 number in shaft orientations in the pitch of 0.5-30 mm.

the outer diameter of the electrodes 14, 16, and 18 for these outer walls -- the outer diameter of the catheter body 6 -- it is the same (a level difference does not arise -- as) -- carrying out is preferred. It is preferred to fill up the joint (level difference) portion of the electrodes 14, 16, and 18 for outer walls and the catheter body 6 with the resin 30 for joints, and to lose a level difference. The thing same as the resin 30 for joints as the resin 38 for covering mentioned later is used, and a thing usable as adhesives is preferred.

[0029]As shown in drawing 1 and 3, the end of the lead 34a for electrodes is electrically connected inside the heights 13 of the maximum distal end electrode 12, and the terminal area 36a consists of these embodiments. The circumference of this terminal area 36a is covered with the resin 38 for covering. As shown in drawing 2 and 4, the end of another lead 34b for electrodes is electrically connected inside the electrode 14 for outer walls, and the terminal area 36b is constituted. The circumference of this terminal area 36b is covered with the resin 38 for covering. The same may be said of the other electrodes 16 and 18 for outer walls.

[0030]In order to connect an each leads [for electrodes / 34a, 34b, 34c, and 34d] end inside these electrodes 12, 14, 16, and 18, methods, such as soldering or welding, are employable. specifically contacting the connection destination end of the lead 34a to the electrode 12 -- soldering -- or flame welding is carried out. It is the same also about other electrodes. Thereby, connection resilience improves. As solder, the alloy of tin-silver is preferred. Compared with the alloy containing lead, cadmium, etc., it is because biocompatibility is high.

[0031]As the resin 38 for covering, any may be sufficient as urethane resin, an epoxy resin, an acrylic resin, etc. A desirable thing usable also as adhesives as resin is good. As adhesives, an epoxy adhesive, an acrylic adhesive, urethane application, cyanoacrylate adhesive, etc. can be illustrated. The filling body products of this resin 38 are the terminal area 36a and the volume which covers 36b-- thoroughly.

It is 1-18cm^3 preferably.

[0032]The lead 34a for electrodes and 34b-- constitute at least some warp of the braid object for reinforcement from the 2nd tube 10 that is an armored tube, as shown in drawing 1.

It is embedded at the tube wall of the tube 10, and has formed.

If another word is carried out, some braid objects currently embedded at the tube wall of the 2nd tube 10 that is an armored tube are extended from the distal end of the catheter body 6 to the proximal edge exterior, and they are used as the lead 34a for electrodes, and 34b--. It is the lead 34a for electrodes, and the connection structure of 34b-- which mentioned the distal end above, and has connected with each electrodes 12, 14, 16, and 18, and those proximal edges jump out of the proximal edge of the catheter body 6, and are connectable to

the external terminal. As shown in drawing 6, when the proximal edge of the catheter body 6 is equipped with the grasping part 4, the thing of a proximal edge of the lead 34a for electrodes and 34b-- exposed to the exterior from the grasping part 4 is preferred. Leads 34a and 34b for electrodes -- A proximal edge may be connected to an external terminal inside the grasping part 4.

[0033]Next, an example of the manufacturing method of the catheter body 6 of the electrode catheter 2 concerning this embodiment is explained. As shown in drawing 5 (A), the inner tube 6a is prepared first. The inner tube 6a comprises synthetic resins, such as polyurethane, polyamide, and a fluoro-resin, for example, an outer diameter is 0.8-2.2 mm, and an inside diameter is 0.6-2.1 mm. The shaft-orientations length is equivalent to the shaft-orientations length of the catheter body 6.

[0034]Next, as shown in drawing 5 (B), the lead 34a for electrodes prolonged in shaft orientations and the conductive warp used as 34b-- are arranged on the periphery of the inner tube 6a, and in the portion used as an armored tube, it knits on it with the weft 35, and a lump braid object is formed in it. A distal end (the terminal area 36a, 36b--) is extended to the position of the lead 34a for electrodes which comprises conductive warp, and 34b-- to which each electrode is attached, those proximal edges extend so that it may jump out of the proximal edge of the inner tube 6a, and those proximal edges are equipped with the contact button 37a and 37b--.

[0035]Next, the portion equipped with the braid object in the inner tube 6a as shown in drawing 5 (C), A periphery with the portion equipped with the lead 34a for electrodes prolonged in shaft orientations and 34b-- is covered with the common outer tube 6b, and the 1st tube 8 and the 2nd tube 10 which constitute the catheter body 6 concerning this embodiment are obtained. The outer tube 6b comprises polyurethane, polyamide, a fluoro-resin, etc., for example, and is fabricated by a dipping method or extrusion molding.

[0036]next, it is shown in drawing 6 -- as -- the distal end of the catheter body 6 -- winding -- the mechanism for making it movable is explained. Although omitted in drawing 1, the inside of the 1st tube 8 formed in the distal end of the catheter body 6 is equipped with the elastic plate 40 shown in drawing 7 along with the longitudinal direction. This elastic plate 40 comprises a resin board etc. which have spring steel material and elasticity, for example, and it has adhered to the maximum distal end electrode 12 via the fixture 44 from which that distal end was insulated. The fixture 44 may be fabricated by the electrode 12 and one. The proximal edge of the elastic plate 40 is near [boundary part 11] the 1st tube 8 and the 2nd tube 10 which are shown in drawing 6, and is fixed to the 2nd tube 10. When the coil member is arranged in the 2nd tube 10, the proximal edge of the elastic plate 40 may be joined to the distal end of the coil member. Or the stopper member of ring shape may be arranged and the proximal edge of the elastic plate 40 may be made to join or contact this stopper member in about 11 terminal area.

[0037]As shown in drawing 7, the elastic piece 40 is built over the wire 42 for operation along with the longitudinal direction, and the distal end of the wire 42 for operation is joined to the fixture 44. It may join to the distal end of the elastic piece 40 directly, and the distal end of this wire 42 for operation may be joined to the electrode 12. This wire 42 has inserted in the inside of the covering tube 46. This wire 42 passes along the inside of the lumen of the catheter body 6 shown in drawing 6, and that proximal edge is fixed to the top object provided in the inside of the grasping part 4 enabling free axial movement. This top object moves to shaft orientations by rotating the ring shape handle 20 which is shown in drawing 6 and which can be rotated. That is, a top object can move to shaft orientations, the wire 42 for operation can be pulled to the shaft-orientations proximal edge side, and a real line position can be made to carry out winding movement of the elastic plate 40 by rotating the handle 20 from the two-dot chain line position shown in drawing 7. If an opposite direction is made to rotate the handle 20, the elastic piece 40 will perform winding movement contrary to the above.

[0038]As a means for changing the rotation of the handle 20 to the shaft movement of a top object, screwing combination etc. are employable. Rotation of the handle 20 shown in drawing 6 can perform winding movement of the elastic piece 40 from the two-dot chain line position shown in drawing 6 to a real line position, and a screwing release means can also perform movement from a real line position to a dotted-line position. That is, the grasping part 4 may be equipped with the button for canceling screwing with the handle 20 and a top object, and returning a top object to the original position, etc.

[0039]The optional position between a graphic display top two-dot chain line position and a real line position can be made to carry out winding movement of the 1st tube 8 by the side of the distal end of the catheter body 6 which can control winding movement of the elastic piece 40 by moving the wire 42 to shaft orientations, and is shown in drawing 7 as a result, as shown in drawing 7. Thereby, the electrode 12 can be made to tend toward the position of an arbitrary direction in a patient's body.

[0040]Next, the example of a therapy using the electrode catheter concerning this embodiment is shown. As shown in drawing 8, the catheter body of the electrode catheter 2 is inserted so that through and its distal end may reach to the left ventricle 85 of the heart 81 to the femoral artery 93. In that case, operate the handle 20 shown in drawing 6 located in the outside-of-the-body side, it is made to tend toward the position of a request of the distal end of the catheter body 6, and the electrode 12 is brought close to Kent's bundle 92. And the high

frequency current is energized with the high frequency generator 97 between the electrode 12 and the counter electrode plate 96 located in a patient's back. Although energizing conditions in particular are not limited, they are about 300-750 kHz and about output 5-50W, for example.
[0041]The coagulation necrosis of the field (a depth of 5 mm and 10 mm in width) containing the Kent's bundle which is the arrhythmic cause in this way can be cauterized and carried out. the inside of drawing 8 and the numerals 82 -- a right atrium and 83 -- ****** and 87 show sino atrial ****, 88 shows atrioventricular ****, and, as for the left atrium and 86, a right ventricle and 84 show a nerve 89, 90, and 91.
[0042]In the electrode catheter 2 concerning this embodiment, the leads 34a, 34b, 34c, and 34d for electrodes connected to each electrodes 12, 14, 16, and 18 are embedded at the tube wall of the tubes 8 and 10 which constitute the catheter body 6. For this reason, in order to make two or more leads for electrodes insert in, it becomes unnecessary to secure the inside diameter of the lumen of the tubes 8 and 10 greatly, the outer diameter of the electrode catheter 2 can be made small, and a patient's burden is eased. The work which inserts two or more leads for electrodes by an insulating state into the lumen of the tubes 8 and 10 becomes unnecessary, and the assembly of the electrode catheter 2 becomes easy. At this embodiment, since it is considered as the lead for electrodes using the part of the conductive fiber for reinforcement needed in the 2nd tube 10 that comprises an armored tube, or the thread, it becomes without newly preparing the lead for electrodes, and the assembly nature of an electrode catheter improves also at this point.
[0043]According to this embodiment, an insulation is secured with the insulating resin of each lead 34a for electrodes, and 34b-- which constitutes the 1st tube 8 and the 2nd tube 10. Therefore, it becomes unnecessary [the special processing for preventing a short circuit]. As shown in drawing 1 - 4, the lead 34a for electrodes and the terminal area 36 of 34b-- which an end electrically connects are formed inside the electrodes 12 and 14, and the resin 38 for covering has covered the circumference of this terminal area 36 in this embodiment. For this reason, it is lost that body fluid trespasses upon the terminal area of the dissimilar metal which are the terminal areas 36a and 36b of the lead 34 and the electrodes 12 and 14, and forming a cell in that portion is lost. As a result, when sending the high frequency current through an electrode and cauterizing the affected part using this electrode catheter, the connection section of an electrode and a lead is low resistance, and the affected part can be cauterized efficiently.
[0044]this invention is not limited to the embodiment mentioned above, within the limits of this invention, can be boiled variously and can be changed. For example, although the embodiment mentioned above is the example which formed in an electrode catheter and one a means to carry out winding movement of the distal end side of an electrode catheter, this invention is not limited to this embodiment. In this invention, the inside of an electrode catheter is used as the cave in shaft orientations, another catheter for operation can be inserted into this cave, and winding moving operation of the distal end of an electrode catheter can also be carried out by this catheter for operation.
[0045]Although a means to have a ring shape handle shown in drawing 6 was used in the above-mentioned embodiment as a control means for carrying out winding movement of the distal end side of an electrode catheter, this invention is not limited to these control means, but can use a lever shape control means or other means.
[0046]Although the cautery therapy was performed in the embodiment mentioned above using the electrode catheter concerning this invention, it may use for the use which detects biopotentials, such as electrocardio, using the electrode of an electrode catheter as the other use. In that case, the lead for electrodes turns into a signal wire for transmitting the biopotential produced in the electrode to the exterior. Also in this embodiment, without doing so the same operation as said embodiment, and forming a cell in that portion, since the terminal area of the lead for electrodes and an electrode is covered by resin, noise decreases and biopotential can be detected more correctly.
[0047]

[Translation done.]

DESCRIPTION OF DRAWINGS

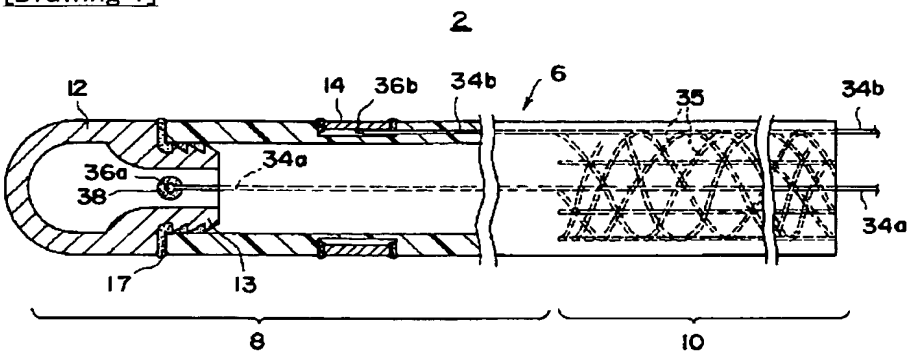
[Brief Description of the Drawings]
[Drawing 1]Drawing 1 is a partial outline sectional view of the electrode catheter concerning one embodiment of this invention.
[Drawing 2]Drawing 2 is an important section outline sectional view of the electrode for outer walls shown in drawing 1.
[Drawing 3]Drawing 3 is the back end side perspective view of the maximum distal end electrode with which the catheter shown in drawing 1 was equipped.
[Drawing 4]Drawing 4 is an outline perspective view of the electrode for outer walls shown in drawing 1.
[Drawing 5]Drawing 5 (A) - (C) is a schematic diagram showing the example of manufacture of a catheter body.
[Drawing 6]Drawing 6 is an outline perspective view of the electrode catheter concerning one embodiment of this invention.
[Drawing 7]Drawing 7 is an outline perspective view of the elastic plate built in the distal end side of an electrode catheter.
[Drawing 8]Drawing 8 is an explanatory view showing the example of 1 use of an electrode catheter.
[Description of Notations]
2 -- Electrode catheter
4 -- Grasping part
6 -- Catheter body
6a -- Inner tube
6b -- Outer tube
8 -- The 1st tube
10 -- The 2nd tube
12 -- The maximum distal end electrode
14, 16, 18 -- Electrode for outer walls
20 -- Ring shape handle
30 -- Resin for joints
34a, 34b, 34c, 34d -- Lead for electrodes
35 -- Weft
36a, 36b, 36c, 36d -- Terminal area
38 -- Resin for covering
40 -- Elastic plate
42 -- Wire for operation

* NOTICES *

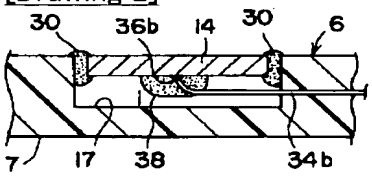
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

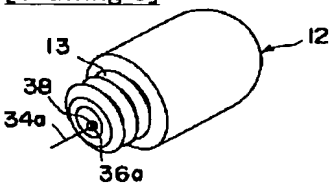
[Drawing 1]



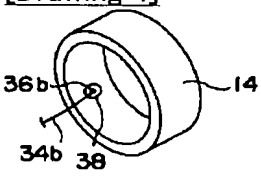
[Drawing 2]



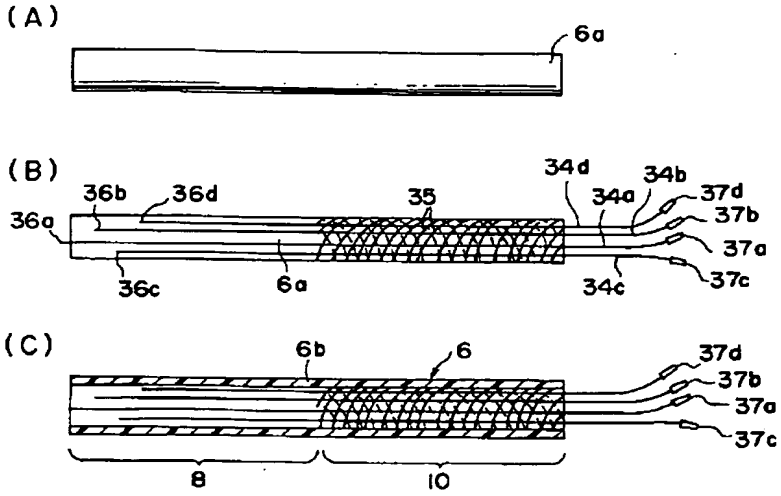
[Drawing 3]



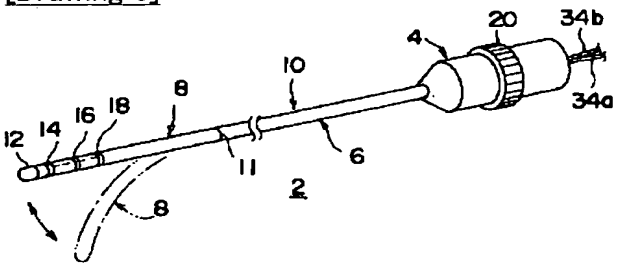
[Drawing 4]



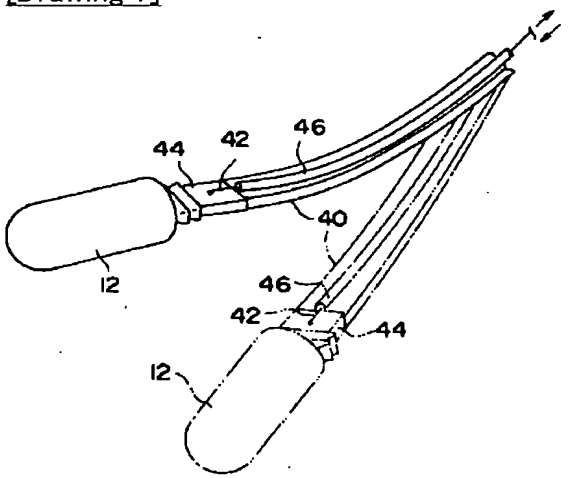
[Drawing 5]



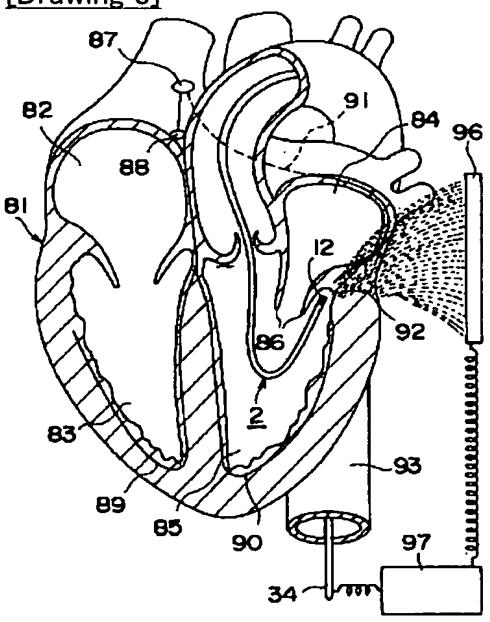
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]

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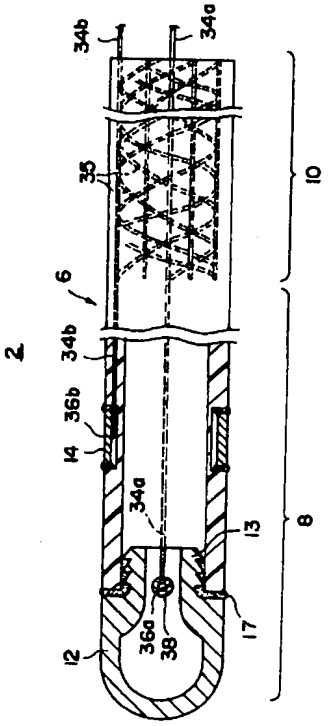
(54)【発明の名称】　電極カテーテル

(57)【要約】

【課題】　電極カテーテルの外径を細くし、患者の負担を軽減し、組立が容易な電極カテーテルを提供する電極カテーテルを提供すること。

【解決手段】　体腔内に挿入されるカテーテル２の遠位端に電極１２，１４が装着された電極カテーテル２であって、各電極１２，１４に接続される電極用導線３４ａ，３４ｂが、カテーテル本体６を構成するチューブ８，１０の管壁に埋め込まれている。これら電極用導線３４ａ，３４ｂは、補強チューブ１０のための編組体を構成する縦糸の一部で構成される。



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【特許請求の範囲】

【請求項１】　体腔内に挿入されるカテーテルの遠位端および遠位端近傍に複数の電極が装着された電極カテーテルであって、

前記各電極に接続される電極用導線が、カテーテル本体を構成するチューブの管壁に埋め込まれていることを特徴とする電極カテーテル。

【請求項２】　電極、電極用導線、カテーテル本体および把持部からなり、

カテーテル本体は遠位端から近位端までを連通するルーメンを有し、把持部が該カテーテル本体の近位端部に設けられ、

電極がカテーテル本体の遠位端および遠位端部のカテーテル本体外壁に複数設けられ、遠位端に設けられた電極は弾丸形状をなし、カテーテル本体外壁に設けられた電極は環形状をなしており、

電極用導線はカテーテル本体を構成するチューブの管壁内に埋め込まれてチューブ遠位端から近位端まで挿通しており、一端が電極と電気的に接続され、他端が把持部の外側に伸長していることを特徴とする電極カテーテル。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、電極カテーテルに関する。

【０００２】

【従来の技術】電極カテーテルは、生体の電位（たとえば心電［数十ｍＶ］）を測定するため、または生体患部に高周波電気を流して患部を焼灼（アブレーション）するためなどに使用される。

【０００３】

【発明が解決しようとする課題】生体管腔（以下、体腔とも称す）はきわめて細いので、電極カテーテルの外径も体腔の内径に合わせて細くする必要がある。一方、電極カテーテルは、体外から体腔を通して患部へ押し込むので、トルク伝達特性が高いことが要求される。

【０００４】また、電極カテーテルの電極には、外部からあるいは外部へ電気を通じさせるために、電極用導線がチューブルーメン内を挿通してあるので、チューブで構成される電極カテーテルの外径を細くするには限界がある。複数の電極用導線を挿通するために十分なチューブルーメンを確保するためである。

【０００５】さらに、チューブルーメン内に複数の電極用導線を絶縁状態で挿入する必要があることから、電極カテーテルの組立が煩雑になっていた。本発明は、このような実状に鑑みてなされ、電極カテーテルの外径を細くし、患者の負担を軽減し、組立が容易な電極カテーテルを提供することを目的とする。

【０００６】

【課題を解決するための手段】上記目的を達成するため

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に、本発明に係る電極カテーテルは、体腔内に挿入されるカテーテルの遠位端および遠位端近傍に複数の電極が装着された電極カテーテルであって、前記各電極に接続される電極用導線が、カテーテル本体を構成するチューブの管壁に埋め込まれていることを特徴とする。

【０００７】より具体的には、本発明に係る電極カテーテルは、電極、電極用導線、カテーテル本体および把持部からなり、カテーテル本体は遠位端から近位端までを連通するルーメンを有し、把持部が該カテーテル本体の近位端部に設けられ、電極がカテーテル本体の遠位端および遠位端部のカテーテル本体外壁に複数設けられ、遠位端に設けられた電極は弾丸形状をなし、カテーテル本体外壁に設けられた電極は環形状をなしており、電極用導線はカテーテル本体を構成するチューブの管壁内に埋め込まれてチューブ遠位端から近位端まで挿通しており、一端が電極と電気的に接続され、他端が把持部の外側に伸長していることを特徴とする。

【０００８】本発明において、電極用導線は、特に限定されず、導電性のものであれば良いが、エナメル被覆導線などの被覆線であることが好ましい。各電極について単一の電極用導線が接続されることが通常であるが、抵抗を下げるために、各電極に関して、複数の電極用導線を接続しても良い。

【０００９】本発明において、さらに好ましくは、電極用導線は、カテーテル本体の少なくとも一部を構成する補強チューブの管壁に埋め込まれている補強用導電性繊維または糸の一部で構成されることが望ましい。すなわち、補強用導電性繊維または糸の一部がカテーテル本体を構成するチューブの管壁内で遠位端から近位端にまで伸長することにより、電極用導線が構成されることが好ましい。補強用導電性繊維または糸としては、導電性を有するものであれば特に限定されないが、高分子樹脂で絶縁された金属繊維、ワイヤーまたは金属糸であることが好ましい。ただし、補強用導電性繊維または糸として裸の金属繊維または糸を用いても、管壁の樹脂により絶縁されるので、編み込みにより電気的短絡を引き起こすことがない。

【００１０】また、本発明において、電極の温度を測定する熱電対などの温度センサを設け、その温度センサのための導線も、管壁に埋め込むように構成することもできる。本発明において、電極の材質は特に限定されないが、体腔内で腐食しない材質であることが好ましく、白金、イリジウム、レニウム、金など、およびこれらの合金、並びにステンレスが好ましく用いられる。

【００１１】電極の形状も特に限定されないが、カテーテルの遠位端に取り付けられる最遠位端電極は、中空の弾丸形状であることが好ましく、ドーム形状、きのこ形状、円柱形状などの形状を採用することができる。最遠位端電極の近くでカテーテル本体の外周に装着される外壁用電極は環状であることが好ましい。電極の厚みは

０．０５～０．２㎜、その軸方向長さが１～１０㎜、その外径は、カテーテル本体の外径と同じ（段差が生じないよう）にすることが好ましく、通常、１～３㎜である。また、外壁用電極とカテーテル本体との継ぎ目（段差）部分に樹脂を充填するなどして段差をなくすことが好ましい。

【００１２】本発明において、電極の内側に電極用導線の一端を電気的に接続するための方法としては、ハンダ付けあるいは溶接などの方法を採用することができる。具体的には、導線の接続先端を電極に接触させてハンダ付け、あるいは火炎溶接することにより、接続強度が向上する。ハンダとしては、錫－銀の合金が好適である。鉛やカドミウムなどを含有する合金に比べて、生体適合性が高いからである。

【００１３】本発明において、電極と導線との接続部の周囲を被覆することが好ましい。この樹脂としては、特に限定されないが、ウレタン樹脂、エポキシ樹脂、アクリル樹脂などいずれでも良い。好ましくは、樹脂として、接着剤としても使用可能なものがよい。接着剤としては、エポキシ接着剤、アクリル接着剤、ウレタン接着剤、シアノアクリレート系接着剤などを例示することができる。

【００１４】本発明において、カテーテル本体を構成するチューブとしては、特に限定されず、通常のカテーテルと同じように、ワイヤブレードまたはコイルチューブ等の剛性付与体で補強されたチューブでも良い。本発明では、補強用に埋め込まれたワイヤーブレードの内の軸方向に伸延する導電性ワイヤー線の一部を電極用導線として用いることができる。

【００１５】本発明に係る電極カテーテルの近位端に設けられる把持部としては、特に限定されず、通常のカテーテルと同じように、カテーテル本体よりも外径が大きく手で持ち易くできる把持部が用いられ得る。本発明に係る電極カテーテルの用途は、特に限定されず、心臓のケント束の焼灼治療、除去すべき組織の焼灼、あるいは焼灼以外に電極を用いて加熱する治療、あるいは電極を用いて生体の電位を測定する用途などに用いることができる。

【００１６】

【作用】本発明に係る電極カテーテルでは、各電極に接続される電極用導線が、カテーテル本体を構成するチューブの管壁に埋め込まれている。このため、複数の電極用導線を挿通させるために、チューブのルーメンの内径を大きく確保する必要がなくなり、電極カテーテルの外径を小さくすることができ、患者の負担が軽減される。また、チューブのルーメン内に複数の電極用導線を絶縁状態で挿入する作業が不要となり、電極カテーテルの組立が容易になる。

【００１７】本発明では、各電極用導線の絶縁は、チューブを構成する絶縁性樹脂により確保される。本発明において、電極用導線を、カテーテル本体の少なくとも一部を構成する補強チューブの管壁に埋め込まれている補強用導電性繊維または糸の一部（軸方向に延びているもの）で構成する場合には、新たに電極用導線を準備する必要がなくなり、電極カテーテルの組立がさらに容易になる。この補強用導電性繊維または糸は、補強チューブを構成する高分子樹脂で絶縁されているため、電極用導線として用いた場合に、電気的短絡のおそれもない。したがって、短絡を防止するための特別な処理も不要となる。

【００１８】

【発明の実施の形態】以下、本発明に係る電極カテーテルを、図面に示す実施形態に基づき、詳細に説明する。図１～８に示す本実施形態に係る電極カテーテルは、たとえば心臓のケント束の焼灼治療などに用いられる電極カテーテルである。

【００１９】図６に示すように、本実施形態に係る電極カテーテル２は、カテーテルの近位端に設けられた把持部４と、この把持部４に接合されたチューブ状のカテーテル本体６とを有する。カテーテル本体６は、遠位端側に設けられた第１チューブ８と、この第１チューブ８の近位端に接続してある第２チューブ１０とを有する。

【００２０】これらチューブ８，１０は、外径が０．３㎜～５㎜、好ましくは１㎜～３㎜であり、内径が０．１㎜～４．８㎜、好ましくは０．８～２．８㎜である。また、その素材としては、抗血栓性の可撓性樹脂が好ましく、ポリウレタン、ポリアミド、ポリ塩化ビニルなどで構成されることが好ましい。

【００２１】近位端側の第２チューブ１０は、遠位端側の第１チューブ８に比較して、高硬度あるいは高剛性であることが好ましい。たとえば第１チューブ８の硬度をショア硬度で１０D～５５D、好ましくは２５D～４５Dとした場合には、第２チューブ１０の硬度は、５０D～９０D、好ましくは５５D～７５Dである。また、近位端側の第２チューブ１０の剛性を高くし、第１チューブ８の屈曲時に近位端側の第２チューブ１０に不必要なねじれや撓みなどが生じないように、第２チューブ１０の内側にコイル状部材を配置させても良い。

【００２２】本実施形態では、図１に示すように、第２チューブ１０を編組体で補強された補強チューブで構成してある。編組体は、軸方向に延びる縦糸と、周方向に延びる横糸３５とから成り、第２チューブの管壁に内蔵してある。本実施形態では、編組体の内の軸方向に延びる縦糸を導電性繊維または糸で構成し、縦糸の内の数本を、電極用導線３４ａ，３４ｂ…として用いるために、カテーテル本体の遠位端から近位端の外部まで延びるように配置してある。

【００２３】本実施形態において用いることができる導電性繊維または糸としては、銅、ステンレス、銀、白金、タングステン、銀合金などを例示することができ、

その繊維径または糸径は、所望以下の低抵抗が得られるように決定される。補強用チューブで構成される第２チューブ１０に内蔵される編組体の横糸３５は、縦糸と同様に導電性繊維または糸でも良いが、絶縁性繊維または糸であっても良い。横糸３５を導電性繊維または糸で構成する場合には、導電性の縦糸間が短絡しないように編み込まれることが好ましい。縦糸または横糸を構成する導電性繊維または糸の外周を絶縁被覆するように構成しても良い。

【００２４】なお、遠位端側の第１チューブ８を第２チューブ１０に比較して可撓性に優れた材質で構成するのは、後述するように、第１チューブ８を所望に応じて屈曲させるためである。屈曲部分である第１チューブ８の軸方向長さは、特に限定されないが、３０～１００mm程度が好ましい。

【００２５】遠位端側の第１チューブ８の先端には、図１に示すように、最遠位端電極１２が装着してある。また、図１，６に示すように、その最遠位端電極１２の近位端側には、環状の外壁用電極１４，１６，１８が軸方向所定間隔に装着してある。これら電極１２，１４，１６，１８は、体腔内で腐食しない材質であることが好ましく、白金、イリジウム、レニウム、金など、およびこれらの合金、並びにステンレスが好ましく用いられる。

【００２６】最遠位端電極１２は、図３に示すように、弾丸形状であり、先端が半球面状を有し、内部が中空になっており、後端側外周にらせん突部又は蛇腹突起等が形成された凸部１３が形成してある。凸部１３は、図１に示す第１チューブ８の遠位端からルーメン内に嵌入され、最遠位端電極１２は、第１チューブ８の遠位端に接着剤１７又は熱圧着などで接合される。接着剤１７としては、耐熱性に優れた接着剤が好ましく用いられ、たとえばエポキシ接着剤、シアノアクリレート接着剤、ウレタン接着剤などが用いられる。この最遠位端電極１２の外径は、第１チューブ８の外径と略同一である。この最遠位端電極１２が、焼灼用電極として用いられる。

【００２７】外壁用電極１４，１６，１８は、おもに心内の電圧を測定するために装着され、環形状を成している。図２に示すように、第１チューブ８の外周に環状溝１７を軸方向に複数形成し、それらの各溝１７に各外壁用電極１４，１６，１８を装着する。環状溝１７は、たとえば切削加工あるいは熱成型により形成される。

【００２８】外壁用電極１４，１６，１８を第１チューブ８の環状溝に装着する作業を容易にするために、外壁用電極の周方向の一部が切り欠かれていても良い。これら環状の外壁用電極１４，１６，１８は、周方向に２分割以上に分割されていても良い。これら外壁用電極１４，１６，１８は、その軸方向長さが、１～１０mmであり、その径方向厚さが０．０５～０．２mmであり、０．５～３０mmのピッチで１～２０個数を軸方向に設けることが好ましい。これら外壁用電極１４，１６，１８の外径は、カテーテル本体６の外径と同じ（段差が生じないよう）にすることが好ましい。また、外壁用電極１４，１６，１８とカテーテル本体６との継ぎ目（段差）部分に継目用樹脂３０を充填するなどして段差をなくすことが好ましい。継目用樹脂３０としては、後述する被覆用樹脂３８と同様なものが用いられ、接着剤として使用可能なものが好ましい。

【００２９】本実施形態では、図１，３に示すように、最遠位端電極１２の凸部１３の内側に電極用導線３４ａの一端が電気的に接続してあり、接続部３６ａを構成してある。この接続部３６ａの周囲は、被覆用樹脂３８で被覆してある。また、図２，４に示すように、外壁用電極１４の内側に別の電極用導線３４ｂの一端が電気的に接続してあり、接続部３６ｂを構成してある。この接続部３６ｂの周囲は、被覆用樹脂３８で被覆してある。その他の外壁用電極１６，１８についても同様である。

【００３０】これらの電極１２，１４，１６，１８の内側に各電極用導線３４ａ，３４ｂ，３４ｃ，３４ｄの一端を接続するには、ハンダ付けあるいは溶接などの方法を採用することができる。具体的には、導線３４ａの接続先端を電極１２に接触させてハンダ付け、あるいは火炎溶接する。その他の電極に関しても同様である。これにより、接続強度が向上する。ハンダとしては、錫－銀の合金が好適である。鉛やカドミウムなどを含有する合金に比べて、生体適合性が高いからである。

【００３１】被覆用樹脂３８としては、ウレタン樹脂、エポキシ樹脂、アクリル樹脂などいずれでも良い。好ましくは、樹脂として、接着剤としても使用可能なものがよい。接着剤としては、エポキシ接着剤、アクリル接着剤、ウレタン接着剤、シアノアクリレート系接着剤などを例示することができる。この樹脂３８の充填体積は、接続部３６ａ，３６ｂ…を完全に覆うような体積であり、好ましくは１～１８cm^3 である。

【００３２】電極用導線３４ａ，３４ｂ…は、図１に示すように、補強チューブである第２チューブ１０では、補強用編組体の縦糸の少なくとも一部を構成するものであり、チューブ１０の管壁に埋め込まれて形成してある。別言すれば、補強チューブである第２チューブ１０の管壁に埋め込まれている編組体の一部を、カテーテル本体６の遠位端から近位端外部まで延ばし、それらを電極用導線３４ａ，３４ｂ…として用いている。電極用導線３４ａ，３４ｂ…の遠位端は、前述したような接続構造で、各電極１２，１４，１６，１８に接続してあり、それらの近位端は、カテーテル本体６の近位端から飛び出し、外部端子へ接続可能になっている。図６に示すように、カテーテル本体６の近位端に把持部４が装着してある場合には、電極用導線３４ａ，３４ｂ…の近位端は、把持部４から外部へ露出していることが好ましい。なお、電極用導線３４ａ，３４ｂ…の近位端は、把持部４の内部で外部端子に接続されても良い。

【００３３】次に、本実施形態に係る電極カテーテル２のカテーテル本体６の製造方法の一例について説明する。図５（Ａ）に示すように、まず、内側チューブ６ａを準備する。内側チューブ６ａは、たとえばポリウレタン、ポリアミド、フッ素樹脂などの合成樹脂で構成され、外径が０．８～２．２mm、内径が０．６～２．１mmである。その軸方向長さは、カテーテル本体６の軸方向長さに相当する。

【００３４】次に、図５（Ｂ）に示すように、内側チューブ６ａの外周に、軸方向に延びる電極用導線３４ａ，３４ｂ…となる導電性の縦糸を配置すると共に、補強チューブとなる部分では、横糸３５と編み込み編組体を形成する。導電性の縦糸で構成される電極用導線３４ａ，３４ｂ…の遠位端（接続部３６ａ，３６ｂ…）は、各電極が取り付けられる位置まで伸び、それらの近位端は、内側チューブ６ａの近位端から飛び出すように延び、それらの近位端には接続端子３７ａ，３７ｂ…が装着してある。

【００３５】次に、図５（Ｃ）に示すように、内側チューブ６ａにおいて、編組体が装着された部分と、軸方向に延びる電極用導線３４ａ，３４ｂ…が装着された部分との外周を、共通の外側チューブ６ｂで被覆し、本実施形態に係るカテーテル本体６を構成する第１チューブ８と第２チューブ１０とを得る。外側チューブ６ｂは、たとえばポリウレタン、ポリアミド、フッ素樹脂などで構成され、ディッピング法あるいは押し出し成形などで成形される。

【００３６】次に、図６に示すように、カテーテル本体６の遠位端を曲折移動可能にするための機構に関して説明する。図１では省略してあるが、カテーテル本体６の遠位端に設けられた第１チューブ８の内部には、図７に示す弾性板４０が長手方向に沿って装着してある。この弾性板４０は、たとえばバネ鋼材、弾力性のある樹脂板などで構成され、その遠位端が、絶縁された取付具４４を介して最遠位端電極１２に固着してある。取付具４４は、電極１２と一体に成形されても良い。弾性板４０の近位端は、図６に示す第１チューブ８と第２チューブ１０との境界部１１付近で、第２チューブ１０に固定してある。第２チューブ１０内にコイル部材が配置されている場合には、そのコイル部材の遠位端に弾性板４０の近位端を接合しても良い。または、接続部１１近傍内に、リング状のストッパ部材を配置し、このストッパ部材に、弾性板４０の近位端を接合または当接させても良い。

【００３７】図７に示すように、弾性片４０には、その長手方向に沿って、操作用ワイヤ４２が掛け渡してあり、操作用ワイヤ４２の遠位端が取付具４４に接合してある。この操作用ワイヤ４２の遠位端は、弾性片４０の遠位端に直接に接合しても良いし、電極１２に接合しても良い。このワイヤ４２は、被覆チューブ４６内を挿通している。このワイヤ４２は、図６に示すカテーテル本体６のルーメン内を通り、その近位端は、把持部４の内部に軸方向移動自在に設けられたコマ体に固定してある。このコマ体は、図６に示す回転自在なリング状ハンドル２０を回転させることにより、軸方向に移動するようになっている。すなわち、ハンドル２０を回転することで、コマ体が軸方向に移動し、操作用ワイヤ４２を軸方向近位端側に引っ張り、図７に示す二点鎖線位置から実線位置に、弾性板４０を曲折移動させることができる。ハンドル２０を逆方向に回動させれば、弾性片４０は上記と逆の曲折移動を行う。

【００３８】なお、ハンドル２０の回転移動をコマ体の軸移動に変化するための手段としては、螺合結合などを採用することができる。図６に示す二点鎖線位置から実線位置までの弾性片４０の曲折移動を、図６に示すハンドル２０の回転により行い、実線位置から点線位置までの移動を、螺合解除手段により行うこともできる。すなわち、ハンドル２０とコマ体との螺合を解除してコマ体を元の位置に戻すためのボタンなどを把持部４に装着しても良い。

【００３９】図７に示すように、ワイヤ４２を軸方向に移動させることで、弾性片４０の曲折移動を制御することができ、その結果、図７に示すカテーテル本体６の遠位端側の第１チューブ８を図示上二点鎖線位置と実線位置との間の任意位置に曲折移動させることができる。これにより、電極１２を患者の体内で、任意方向の位置に向かわせることができる。

【００４０】次に、本実施形態に係る電極カテーテルを用いた治療例を示す。図８に示すように、電極カテーテル２のカテーテル本体を大腿動脈９３へ通し、その遠位端が心臓８１の左心室８５まで到達するように挿入する。その際に、体外側に位置する図６に示すハンドル２０を操作し、カテーテル本体６の遠位端を所望の位置に向かわせ、電極１２をケント束９２に近づける。そして、高周波発生装置９７により、電極１２と患者の背中に位置する対極板９６との間に高周波電流を通電する。通電条件は、特に限定されないが、たとえば３００～７５０ｋＨｚ程度、出力５～５０Ｗ程度である。

【００４１】かくして、不整脈の原因となっているケント束を含む領域（深さ５mm、幅１０mm）を焼灼して凝固壊死させることができる。なお、図８中、符号８２は右心房、８３は右心室、８４は左心房、８６は僧帽弁、８７は洞房経節、８８は房室経節、８９，９０，９１は神経を示す。

【００４２】本実施形態に係る電極カテーテル２では、各電極１２，１４，１６，１８に接続される電極用導線３４ａ，３４ｂ，３４ｃ，３４ｄが、カテーテル本体６を構成するチューブ８，１０の管壁に埋め込まれている。このため、複数の電極用導線を挿通させるために、チューブ８，１０のルーメンの内径を大きく確保する必

要がなくなり、電極カテーテル2の外径を小さくすることができ、患者の負担が軽減される。また、チューブ8，10のルーメン内に複数の電極用導線を絶縁状態で挿入する作業が不要となり、電極カテーテル2の組立が容易になる。また、本実施形態では、補強チューブで構成される第2チューブ10において必要とされる補強用導電性繊維または糸のうちの一部を用いて、電極用導線としているので、新たに電極用導線を準備することなくなり、この点でも、電極カテーテルの組立性が向上する。

【0043】本実施形態では、各電極用導線34a，34b…の絶縁は、第1チューブ8および第2チューブ10を構成する絶縁性樹脂により確保される。したがって、短絡を防止するための特別な処理も不要となる。また、本実施形態では、図1～4に示すように、電極12，14の内側に、電極用導線34a，34b…の一端が電気的に接続する接続部36が形成してあり、この接続部36の周囲が被覆用樹脂38で被覆してある。このため、導線34と電極12，14との接続部36a，36bである異種金属の接続部に、体液が侵入することはなくなり、その部分で電池を形成することはなくなる。その結果、この電極カテーテルを用いて、電極に高周波電流を流して患部を焼灼する際には、電極と導線との接続部分が低抵抗であり、効率的に患部を焼灼することができる。

【0044】なお、本発明は、上述した実施形態に限定されるものではなく、本発明の範囲内で種々に改変することができる。たとえば、上述した実施形態は、電極カテーテルの遠位端側を曲折移動させる手段を電極カテーテルと一体に形成した例であるが、本発明はこの実施形態に限定されない。本発明では、電極カテーテルの内部を軸方向に空洞にしておき、この空洞内に、別の操作用カテーテルを挿入し、この操作用カテーテルで電極カテーテルの遠位端を曲折移動操作することもできる。

【0045】また、上記実施形態では、電極カテーテルの遠位端側を曲折移動させるための操作手段として、図6に示すリング状ハンドルを有する手段を用いたが、本発明はこれらの操作手段に限定されず、レバー状操作手段あるいはその他の手段を用いることができる。

【0046】また、上述した実施形態では、本発明に係る電極カテーテルを用いて、焼灼治療を行ったが、それ以外の用途として、電極カテーテルの電極を用いて、心電などの生体電位を検知する用途に用いても良い。その場合、電極用導線は、電極に生じた生体電位を外部へ伝達するための信号線となる。この実施態様でも、前記実施態様と同様な作用を奏すると共に、電極用導線と電極との接続部が樹脂で覆われていることから、その部分で電池が形成されることもなく、雑音が少なくなり、生体電位を、より正確に検知することができる。

【0047】

【発明の効果】以上説明してきたように、本発明によれば、電極カテーテルの外径を小さくすることができ、患者の負担が軽減される。また、チューブのルーメン内に複数の電極用導線を絶縁状態で挿入する作業が不要となり、電極カテーテルの組立が容易になる。本発明では、各電極用導線の絶縁は、チューブを構成する絶縁性樹脂により確保される。

【0048】本発明において、電極用導線を、カテーテル本体の少なくとも一部を構成する補強チューブの管壁に埋め込まれている補強用導電性繊維または糸の一部（軸方向に延びているもの）で構成する場合には、新たに電極用導線を準備する必要がなくなり、電極カテーテルの組立がさらに容易になる。この補強用導電性繊維または糸は、補強チューブを構成する高分子樹脂で絶縁されているため、電極用導線として用いた場合に、電気的短絡のおそれもない。したがって、短絡を防止するための特別な処理も不要となる。

【図面の簡単な説明】

【図1】図1は本発明の一実施形態に係る電極カテーテルの部分的な概略断面図である。

【図2】図2は図1に示す外壁用電極の要部概略断面図である。

【図3】図3は図1に示すカテーテルに装着された最遠位端電極の後端側斜視図である。

【図4】図4は図1に示す外壁用電極の概略斜視図である。

【図5】図5（A）～（C）はカテーテル本体の製造例を示す概略図である。

【図6】図6は本発明の一実施形態に係る電極カテーテルの概略斜視図である。

【図7】図7は電極カテーテルの遠位端側に内蔵される弾性板の概略斜視図である。

【図8】図8は電極カテーテルの一使用例を示す説明図である。

【符号の説明】

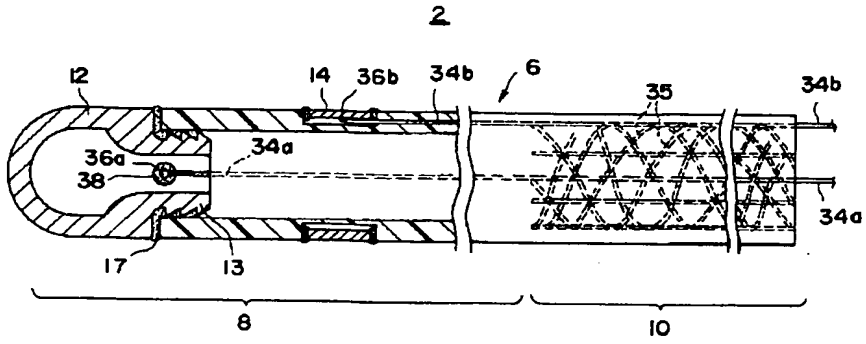
2… 電極カテーテル
4… 把持部
6… カテーテル本体
6a… 内側チューブ
6b… 外側チューブ
8… 第1チューブ
10… 第2チューブ
12… 最遠位端電極
14，16，18… 外壁用電極
20… リング状ハンドル
30… 継目用樹脂
34a，34b，34c，34d… 電極用導線
35… 横糸
36a，36b，36c，36d… 接続部
38… 被覆用樹脂

11　　12

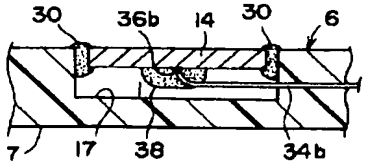
４０…　弾性板

４２…　操作用ワイヤ

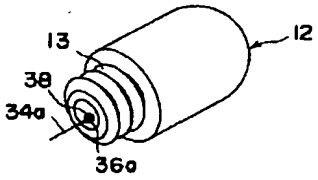
【図１】



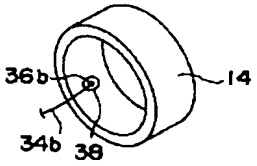
【図２】



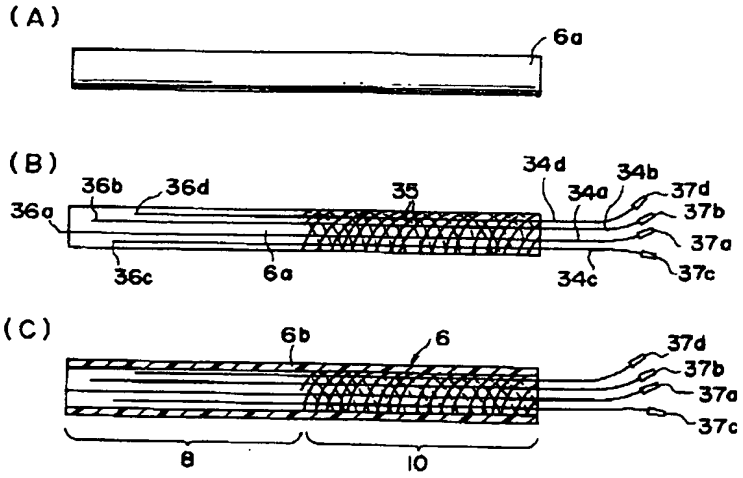
【図３】



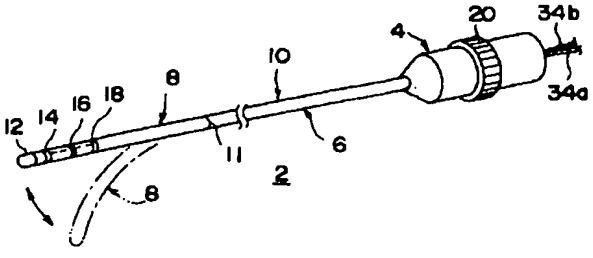
【図４】



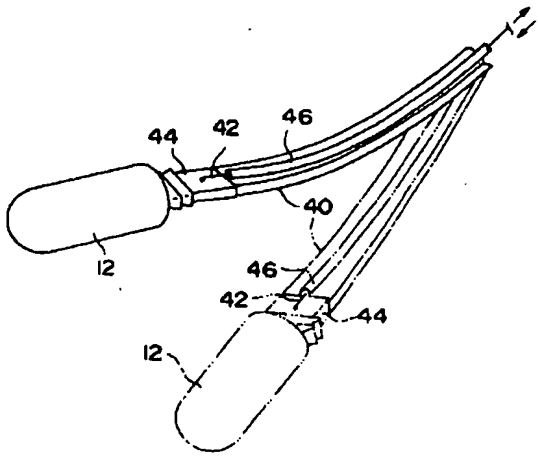
【図５】



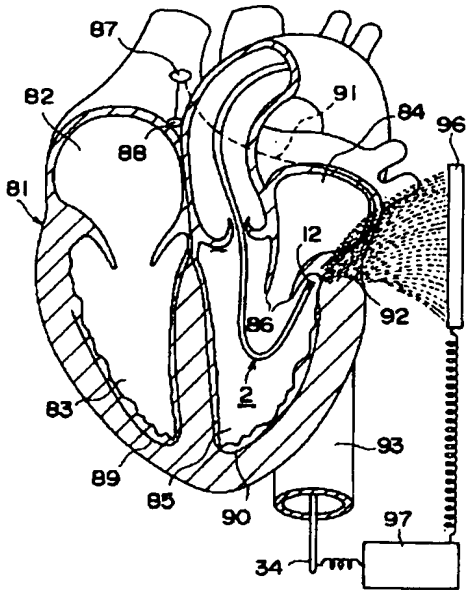
【図６】



【図７】



【図８】



フロントページの続き

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Ａ６１Ｂ　17/38	３１０			